

Question 25 (13 marks) Use the Question 25 Writing Booklet.

- (a) A study on the mobile phone usage of NSW high school students is to be conducted. Data is to be gathered using a questionnaire.

The questionnaire begins with the three questions shown.

Q1: Do you own a mobile phone? Yes <input type="checkbox"/> No <input type="checkbox"/>
Q2: Which phone company do you use?
Q3: Do you use pre-paid or a plan? Pre-paid <input type="checkbox"/> Plan <input type="checkbox"/>

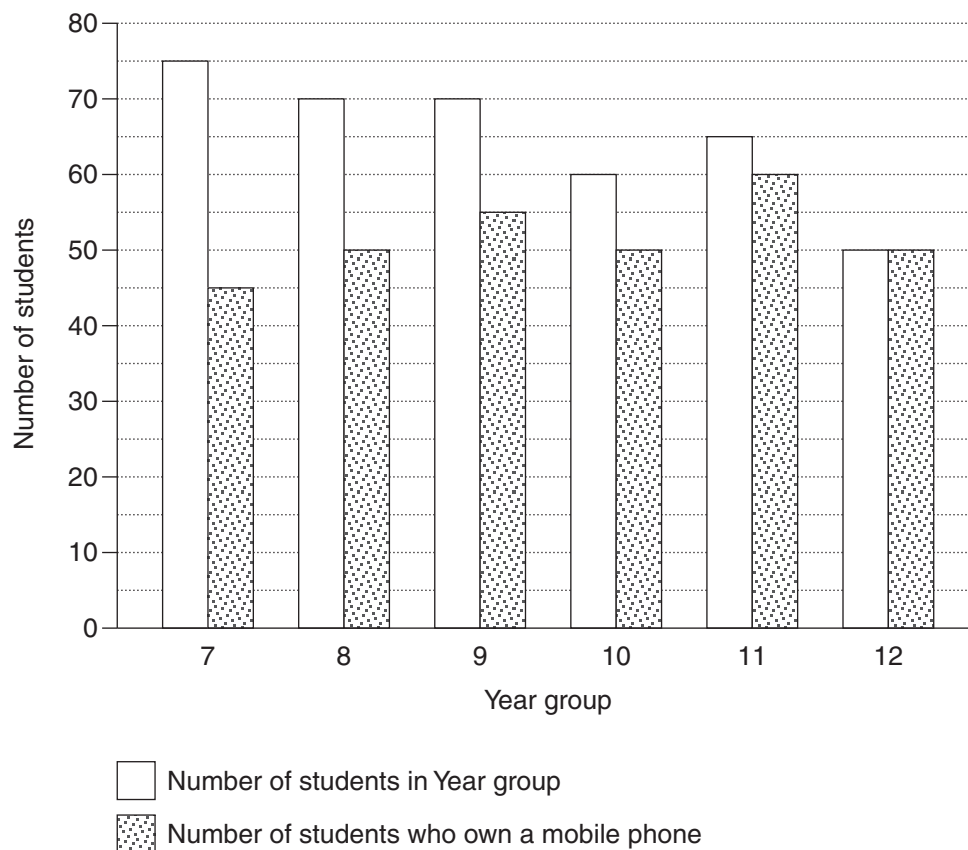
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| (i) Classify the type of data that will be collected in Q2 of the questionnaire. | 1 |
| (ii) Write a suitable question for this questionnaire that would provide quantitative data. | 1 |
| (iii) An initial study is to be conducted using a stratified sample.

Describe a method that could be used to obtain a representative stratified sample. | 1 |
| (iv) Who should be surveyed if it is decided to use a census for the study? | 1 |

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Question 25 (continued)

- (b) The graph below displays data collected at a school on the number of students in each Year group, who own a mobile phone.



- (i) Which Year group has the highest percentage of students with mobile phones? **1**
- (ii) Two students are chosen at random, one from Year 9 and one from Year 10. Which student is more likely to own a mobile phone? Justify your answer with suitable calculations. **2**
- (iii) Identify a trend in the data shown in the graph. **1**

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Question 25 (continued)

- (c) At another school, students who use mobile phones were surveyed. The set of data is shown in the table.

	<i>Pre-paid</i>	<i>Plan</i>	TOTAL
<i>Female students</i>	172	147	319
<i>Male students</i>	158	103	261
TOTAL	330	250	

- (i) How many students were surveyed at this school? 1
- (ii) Of the female students surveyed, one is chosen at random. What is the probability that she uses pre-paid? 1
- (iii) Ten new male students are surveyed and all ten are on a plan. The set of data is updated to include this information. What percentage of the male students surveyed are now on a plan? Give your answer to the nearest per cent. 1
- (d) Data was collected from 30 students on the number of text messages they had sent in the previous 24 hours. The set of data collected is displayed.

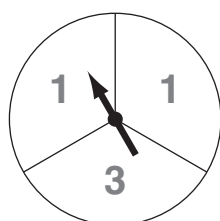
<i>Male</i>		<i>Female</i>
9 9 8 7 6 5 5 4 2 1	0	8 9
1 1 0 0	1	1 1 2 5 6 8 8 8
0	2	0 1 7
	3	4
	4	
	5	
	6	
1	7	

- (i) What is the outlier for this set of data? 1
- (ii) What is the interquartile range of the data collected from the female students? 1

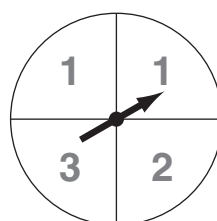
End of Question 25

Question 26 (13 marks) Use the Question 26 Writing Booklet.

- (a) The two spinners shown are used in a game.



Spinner A



Spinner B

Each arrow is spun once. The score is the total of the two numbers shown by the arrows.

A table is drawn up to show all scores that can be obtained in this game.

		Spinner B			
		1	1	2	3
Spinner A	1	2	2	3	4
	1	2	2	3	4
	3	4	4	X	6

- (i) What is the value of X in the table? **1**
- (ii) What is the probability of obtaining a score less than 4? **1**
- (iii) On Spinner B, a 2 is obtained. What is the probability of obtaining a score of 3? **1**
- (iv) Elise plays a game using the spinners with the following financial outcomes. **3**
- Win \$12 for a score of 4
 - Win nothing for a score of less than 4
 - Lose \$3 for a score of more than 4

It costs \$5 to play this game. Will Elise expect a gain or a loss and how much will it be? Justify your answer with suitable calculations.

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Question 26 (continued)

- (b) Jack needs to find the number of years, t , it will take for a population of bats to first exceed 18 000.

He uses a ‘guess-and-check’ method to estimate t in the following equation

$$5 \times 3^t = 18\,000.$$

Here is his working:

Try $t = 9$

$$5 \times 3^9 = 98\,415$$

Conclusion: $t = 9$ is too big.

- (i) Jack’s next guess is $t = 6$. Show Jack’s correct working for this guess, including the calculation and conclusion. **1**
- (ii) Continue using the ‘guess-and-check’ method to find the number of years, t , it will take for the population to first exceed 18 000, if t is a whole number. Include the calculations and conclusions. **2**
- (c) Furniture priced at \$20 000 is purchased. A deposit of 15% is paid. **4**

The balance is borrowed using a flat-rate loan at 19% per annum interest, to be repaid in equal monthly instalments over five years.

What will be the amount of each monthly instalment? Justify your answer with suitable calculations.

End of Question 26

Question 27 (13 marks) Use the Question 27 Writing Booklet.

- (a) A company sells handbags in Paris, New York and Florence.

2

Use the data in the table to complete the area chart on page 1 of the Question 27 Writing Booklet.

	<i>Winter 2010</i>	<i>Spring 2010</i>	<i>Summer 2010</i>	<i>Autumn 2010</i>
<i>Number of handbags sold in Paris</i>	60 000	70 000	50 000	70 000

- (b) Pontianak has a longitude of 109°E , and Jarvis Island has a longitude of 160°W . Both places lie on the Equator.

- (i) Find the shortest distance between these two places, to the nearest kilometre. You may assume that the radius of the Earth is 6400 km.

2

- (ii) The position of Rabaul is 4° to the south and 48° to the west of Jarvis Island. What is the latitude and longitude of Rabaul?

2

Question 27 continues on page 22

Question 27 (continued)

- (c) Two brands of light bulbs are being compared. For each brand, the life of the light bulbs is normally distributed.

Life of light bulbs (in hours)

	<i>Mean</i>	<i>Standard deviation</i>
<i>Brand A</i>	450	25
<i>Brand B</i>	500	50

- (i) One of the Brand B light bulbs has a life of 400 hours. **1**

What is the z -score of the life of this light bulb?

- (ii) A light bulb is considered defective if it lasts less than 400 hours. The following claim is made: **2**

‘Brand A light bulbs are more likely
to be defective than Brand B light bulbs.’

Is this claim correct? Justify your answer, with reference to z -scores or standard deviations or the normal distribution.

- (d) Josephine invests \$50 000 for 15 years, at an interest rate of 6% per annum, compounded annually. **4**

Emma invests \$500 at the end of each month for 15 years, at an interest rate of 6% per annum, compounded monthly.

Financial gain is defined as the difference between the final value of an investment and the total contributions.

Who will have the better financial gain after 15 years? Justify your answer with suitable calculations. You must show the correct values substituted into appropriate formulas.

End of Question 27

Question 28 (13 marks) Use the Question 28 Writing Booklet.

- (a) The air pressure, P , in a bubble varies inversely with the volume, V , of the bubble.

(i) Write an equation relating P , V and a , where a is a constant. **1**

(ii) It is known that $P = 3$ when $V = 2$. **2**

By finding the value of the constant, a , find the value of P when $V = 4$.

(iii) Sketch a graph to show how P varies for different values of V . **2**

Use the horizontal axis to represent volume and the vertical axis to represent air pressure.

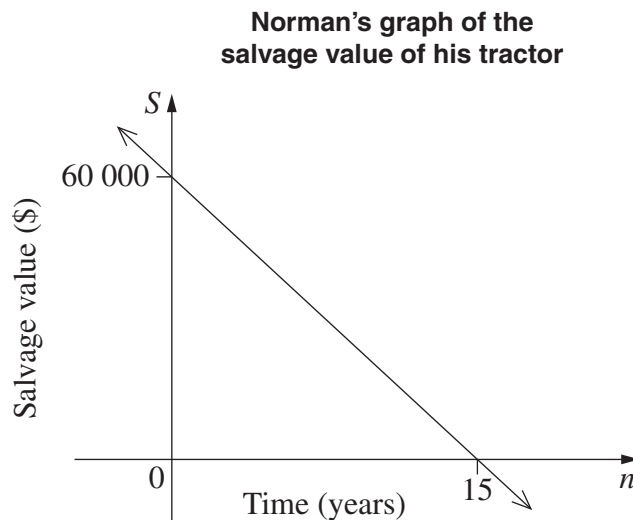
Question 28 continues on page 24

Question 28 (continued)

- (b) Norman and Pat each bought the same type of tractor for \$60 000 at the same time. The value of their tractors depreciated over time.

The salvage value S , in dollars, of each tractor, is its depreciated value after n years.

Norman drew a graph to represent the salvage value of his tractor.



- | | |
|---|---|
| (i) Find the gradient of the line shown in the graph. | 1 |
| (ii) What does the value of the gradient represent in this situation? | 1 |
| (iii) Write down the equation of the line shown in the graph. | 1 |
| (iv) Find all the values of n that are not suitable for Norman to use when calculating the salvage value of his tractor. Explain why these values are not suitable. | 2 |

Pat used the declining balance formula for calculating the salvage value of her tractor. The depreciation rate that she used was 20% per annum.

- | | |
|--|---|
| (v) What did Pat calculate the salvage value of her tractor to be after 14 years? | 2 |
| (vi) Using Pat's method for depreciation, describe what happens to the salvage value of her tractor for all values of n greater than 15. | 1 |

End of paper